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高氮条件下硫氮互作对冬小麦幼苗生长及氮、硫吸收利用的影响

周 杰[1]，王 东[1*]，满建国[1]，谷淑波[1]，陈茂学[2]，于振文[1]

1山东农业大学农学院，作物生物学国家重点实验室，农业部作物生理生态与栽培重点开放实验室，山东泰安 271018； 2山东农业大学信息科学与工程学院，山东泰安 271018

Effects of interaction of nitrogen and sulfur on seedling growth,uptake and utilization of nitrogen and sulfur of winter wheatunder high nitrogen conditions

ZHOU Jie[1], WANG Dong[1*], MAN Jian guo[1], GU Shu bo[1], CHEN Mao xue[2], YU Zhen wen[1*]

1 College of Agronomy, Shandong Agricultural University/ State Key Laboratory of Crop Biology / Key Laboratory of Crop Physiology, Ecology and Production, Ministry of Agriculture, Taian, Shandong 271018, China;2 College of Information Science and Engineering, Shandong Agricultural University, Taian, Shandong 271018, China

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摘要 本试验在水培条件下，研究了不同氮、硫水平对小麦幼苗生长及氮、硫吸收利用的影响。结果表明，同一供氮水平下，在0.15 mmol/L～2.40 mmol/L供硫水平范围内，小麦幼苗根系活力随供硫水平的提高而显著下降。在4 mmol/L供氮水平下提高供硫水平，小麦幼苗植株地上部含硫量和含氮量均增加，叶片光合速率提高，对叶片和次生根的发育均有促进作用，增加了地上部和根系干物质积累量，但硫素利用效率和氮素利用效率降低。在8 mmol/L供氮水平下，随供硫水平的提高，小麦幼苗地上部含硫量增加，含氮量无显著变化；供硫水平过高则导致幼苗叶片光合同化能力降低，对幼苗发育、地上部和根部干物质及氮硫素积累不利，氮、硫利用效率降低。在0.15 mmol/L供硫水平下提高供氮水平有利于增加小麦幼苗地上部和根系含氮量，在2.40 mmol/L供硫水平下提高供氮水平对小麦幼苗地上部和根系含氮量无显著影响。说明在一定的氮、硫供应水平下，氮素和硫素之间存在互促效应；供应水平过高，则相互抑制，不利于小麦对氮、硫的吸收和利用。不同品种对氮、硫供应水平的反应不同，与鲁麦21和烟农19相比，在4 mmol/L供氮水平下，较高的供硫水平更有利于豫麦34和淄麦12各器官硫素和氮素的积累；在8 mmol/L供氮水平下，豫麦34和淄麦12对过高供硫水平的耐受能力较强。

关键词： 冬小麦 氮 硫 吸收 利用

Abstract： The effects of interaction between nitrogen and sulfur fertilization on seedling growth, uptake and utilization of nitrogen and sulfur of winter wheat were studied in hydroponic conditions. The results show that under the same nitrogen level, the activities of wheat root are decreased significantly in the levels of sulfur from 0.15 mmol/L to 2.40 mmol/L. Under the 4 mmol/L of nitrogen level, the contents of sulfur and nitrogen in shoots of seedlings are increased with the increase of S levels, the photosynthetic rates of leaves are increased, the development of leaves and secondary roots are promoted, and the dry matter accumulations in shoots and roots are increased, while the use efficiencies of sulfur and conducive to the development of seedlings, and the accumulations of dry nitrogen are decreased. Under the 8 mmol/L of nitrogen level, the sulfur contents of wheat shoots are increased with the increase of S levels, while there are not significant changes in the nitrogen contents, and the excessive sulfur application can result in the reduce of the ability of photosynthesis. It is also not matter and nitrogen and sulfur in shoots and roots. Under the 0.15 mmol/L of sulfur level, it is conducive to improve the contents of nitrogen in shoots and roots with the increase of nitrogen levels. Under the 2.40 mmol/L of sulfur level, there are no significant differences in the contents of nitrogen in shoots and roots. These results indicate that at certain levels of nitrogen and sulfur application, there is mutual promotion between nitrogen and sulfur, at too high levels of nitrogen and sulfur application, there is mutual inhibition between them, which is not conducive to the absorptions and uses of nitrogen and sulfur in wheat. The responses of different cultivars to the nitrogen and sulfur fertilization are different. Under the 4 mmol/L nitrogen level, higher level of sulfur is more conducive to the accumulations of sulfur and nitrogen in different organs of Yumai 34 and Zimai 12 compared to those of Lumai 21 and Yannong 19, and under the 8 mmol/L nitrogen level, the tolerance abilities of Yumai 34 and Zimai 12 against excessive sulfur are higher.

Keywords： winter wheat nitrogen sulfur uptake utilization

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Corresponding Authors: 周杰 Email: sdauzhoujie@163.com

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